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PLATE VII., Fig. 1. *a*, Subscapularis accessorius; *b*, Circumflex nerve; *c*, Subscapularis; *d*, Teres major.

" Fig. 2. *a*, Infraspinatus secundus; *b*, Capsular ligament of the shoulder; *c*, Coraco-brachialis; *d*, Biceps.

PLATE VIII., Fig. 1. *a*, Palmaris longus; *b*, Palmaris accessorius; *c*, Flexor Carpi Ulnaris; *d*, Pronator Radii teres; *e*, Flexor Carpi Radialis.

" Fig. 2. *a*, Pronator teres; *b*, Flexor Carpi Radialis; *c*, Palmaris accessorius; *d*, Flexor Carpi Ulnaris.

" Fig. 3. *a*, Bicipital origin of Pronator Radii teres; *b*, *b*, condyloid origin; *c*, Supracondyloid humeral origin; *d*, Flexor Carpi Radialis condyloid origin; *e*, Coronoid origin; *f*, Flexor Carpi Ulnaris; *g*, Supinator longus; *h*, Belly of Pronator teres; *i*, Triceps; *j*, Biceps; *k*, Brachialis anticus.

PLATE IX., Fig. 1. *a*, Semitendinosus; *b*, Semimembranosus; *c*, Biceps Flexor Cruris; *d*, Gastrocnemius; *e*, Plantaris; *f*, Third or middle head of Gastrocnemius.

The Rev. SAMUEL HAUGHTON, M. D., read a series of communications (in continuation)

ON ANIMAL MECHANICS.

No. IX.—ON THE MUSCLES OF THE MARSUPIALS.

MY observations on the muscles of the Marsupials were made on four Kangaroos, an Opossum, and a Phalanger, which died in the Zoological Gardens of Dublin. One of the Kangaroos was the Giant Kangaroo, a female, which had lived for nine years in the Zoological Gardens, and died in January, 1866, after a fortnight's illness, of paraplegia, produced by cold and damp. The other Kangaroos were Wallabys, two female and one male, which died in 1865–66, of scrofulous disease of the lower jaw, presenting similar symptoms in all, and apparently produced by the damp climate of Dublin, from the pernicious effects of which no care seemed sufficient to protect them. The Opossum (female) was from Virginia, and died in January, 1866, and the Phalanger died in 1864. The stomach of the Opossum contained thirty-four lumbrical worms.

PART I.—KANGAROOS.

In describing the muscles of the Kangaroos, I shall refer to them in the following manner:—

a, *Macropus giganteus* (female).
b, *Macropus Vallabiensis* (male).
c, " " (female).
c′, " " (female).

A.—*Muscles of the Hip Joint.*

1. *M. iliacus,*	a,		1·71 oz.
M. psoas magnus,	a,		0·57 oz.
M. psoadiliacus,	a,		2·28 oz.
,,	b,	1·07	1·04 oz.
,,	c,	1·00	

The *iliacus* takes its origin from the surface of the ilium, marked in Fig. 25, and the *psoas magnus* from the bodies of the last two lumbar vertebræ.

2. *M. pectinæus,*	a,		0·36 oz.
,,	b,	0·20	0·25 oz.
,,	c,	0·31	

This muscle takes its origin from the pectinæal line, behind the spine of the pubis, and acts as one of the depressors of the marsupial bones; it is inserted into the second fourth of the linea aspera.

3. *M. adductor brevis,*	a,		0·25 oz.
,,	b,	0·25	0·21 oz.
,,	c,	0·17	

This adductor takes its origin from the anterior line of the pubis, inside the *adductor magnus*, and is inserted into the upper fourth of the linea aspera. It acts as a depressor of the marsupial bone.

4. *M. adductor magnus,*	a,		5·22 oz.
,,	b,	3·53	2·96 oz.
,,	c,	2·39	

The *adductor magnus* takes its origin from the anterior edge of the pubis, from the base of the marsupial bone, from the symphysis pubis, and from the top of the pubic arch; and is inserted into the whole length of the linea aspera. It acts as a depressor of the marsupial bone.

5. *M. adductor longus,*	a,		3·42 oz.
,,	b,	2·31	1·93 oz.
,,	c,	1·56	

This muscle takes its origin from the anterior two thirds of the pubic arch, and is separable with difficulty from the *adductor magnus*, over which it is folded like the double *adductor longus* in the Emu; it is inserted above the back of the inner condyle into the lower fourth of the femur.

6. ***M. obturator externus,***	a,		1·42 oz.
”	b,	0·94	0·80 oz.
”	c,	0·66	

This muscle has a common tendon with ***obturator internus.***

7. ***M. Obturator internus,***	a,		0·34 oz.
et gemelli,	b,	0·27	0·29 oz.
”	c,	0·32	

The origin of these muscles is shown in Fig. 26 (*o. i.* and *g.*), where it will be observed that the origin of the gemelli occupies a larger surface of the ischium than is usual in other animals.

8. ***M. quadratus femoris,***	a,		1·47 oz.
”	b,	1·02	0·91 oz.
”	c,	0·81	

This is one of the most remarkable muscles found in the Kangaroos, and is intended to assist in the support of the animal when resting in its usual attitude, on the tail and hind legs. It takes its origin from the large triangular surface of the ischium, Fig. 25 (*q. f.*), and, thence converging in a pyramidal mass to a point, is inserted into a special trochanter or tubercle, developed for its reception in the middle of the posterior surface of the femur. Fully two-thirds of this pyramidal mass are composed of tendinous fibres, the remaining third being muscular, so that the whole may be regarded as an elastic tendon. When the animal sits upon its tail and legs in the manner above described, it places its feet so far forward, and its tail so far back, that a mechanical observer is at once struck by the apparent want of strength of the arch on which the weight of the body is supported, and is disposed to come to the conclusion that the act of sitting on its tail must be a fatiguing one to the Kangaroo. Observation of their habits, however, abundantly proves the contrary, and shows that the animal prefers this attitude to any other.

Fig. 25.

The explanation of the difficulty is to be found in the semimembranous *quadratus femoris,* which acts as a "*tie-beam*" to the arch, and, without much expenditure of force, supports the weight of the body placed on the vertex of the straddling arch formed by the tail and hind feet. I do not know of any other animal in which the insertion of the *quadratus femoris* is placed so low down on the femur, nor of any in which, as in the Kangaroo, a special trochanter is provided for this muscle.

9. *M. agitator caudæ*,	a,		5·09 oz.
,,	b,	2·20	1·94 oz.
,,	c,	1·91	
,,	c′,	1·70	

This muscle takes its origin from the sides of the 1st, 2nd, and 3rd caudal vertebræ, and joins the posterior portion of the *glutæus maximus* in a long tendon, which is inserted into the side of the patella and lower margin of the *vastus externus.*

10. *M. glutæus maximus posterior*,	a,		6·06 oz.
,,	b,	2·64	2·01 oz.
,,	c,	1·73	
,,	c,	1·67	

takes origin from the sacral fascia and from fascia covering *gl. medius,* is separable with difficulty from *gl. max. anterior,* and is inserted by common tendon with the *agitator caudæ.*

11. *M. glutæus maximus anterior*,	a,		2·46 oz.
,,	b,	1·92	1·65 oz.
,,	c,	1·54	
,,	c′,	1·48	

This muscle takes its origin from the anterior margin of the ilium, behind the origin of *sartorius,* and from the lumbar fascia and that covering the *gl. medius;* and is inserted into the fascia flowing over the great trochanter that gives origin to the *vastus externus.*

12. *M. glutæus medius*,	a,		9·47 oz.
,,	b,	2·53	2·71 oz.
,,	c,	2·90	

Origin from the posterior edge of the ilium, from the ischiadic notch forward, and from the surface of that bone, marked in Fig. 26 (*gl. med.*)

13. *M. glutæus minimus*,	a,		0·62 oz.
,,	b,	1·16	0·74 oz.
,,	c,	0·32	

This muscle takes its origin from the surface of the ilium, marked Fig. 26 (*gl. min.*), and is inserted into the line below the head of the great trochanter, by means of a flat tendon.

14. *M. glutæus quartus* (*iliocapsularis*),	a,		0·49 oz.
„	b,	0·39	0·27 oz.
„	c,	0·16	

This is the muscle described by human anatomists under the name of *ilio capsularis*, as sometimes occurring in the human subject; it belongs to the glutæal group, and not to the iliacal group of muscles, and arises from the surface of the ilium, marked in Fig. 26 (*gl.* 4); and it is inserted by a flat tendon into the prolongation of the insertion of the *glutæus minimus*, with which its action is almost identical.

15. *M. glutæus quintus*,	b,	0·26 oz.

takes origin from the lateral ridge of the ilium, Fig. 26 (*gl.* 5), separating the glutæal from the iliacal surface, and is inserted by flat tendon below *glut. quartus.*

Fig. 26.

16. *M. pyriformis*,	a,		0·44 oz.
„	b,	0·20	0·18 oz.
„	c,	0·16	

This muscle is well developed, and is quite distinct from the *glutæus medius;* it has the usual origin, and is inserted partly into the head of the great trochanter, and partly into the fascial origin of the *vastus externus* that flows over that trochanter.

B.—*Muscles of the Knee Joint.*

1. *M. tensor vaginæ femoris*,	a,		0·84 oz.
„	b,	0·44	0·36 oz.
„	c,	0·28	

This muscle takes its origin from 1¼ inch of the anterior superior portion of the lateral ridge of the ilium, below the origin of the *sartorius*, and is lost in the fascia directly covering the *rectus femoris* halfway down the thigh. I class it, from its connexion with the *rectus*, among the knee joint, rather the hip joint muscles.

2. *M. rectus femoris*,	a,		4·42 oz.
„	b,	2·50	1·94 oz.
„	c,	1·38	
3. *M. vastus externus*,	a,		10·14 oz.
„	b,	4·30	3·95 oz.
„	c,	3·60	

This large muscle takes its origin almost exclusively from the glutæal fascia flowing over the great trochanter, and has only a few fibres arising from the side of the femur; and some fibres of the *pyriformis* are attached to its posterior border.

4. *M. vastus internus,*	a,		1·89 oz.
,,	b,	1·42	1·19 oz.
,,	c,	0·96	
5. *M. crurœus,*	a,		1·37 oz.
,,	b,	0·78	0·78 oz.
,,	c,	0·78	
6. *M. sartorius,*	a,		2·71 oz.
,,	b,	1·15	1·12 oz.
,,	c,	1·08	

This muscle has the usual origin, but is inserted subcentrally into the patella, rather on the inner side; it bears a close resemblance to one of the *sartorii* in the Dog.

7. *M. gracilis,*	a,		2·13 oz.
,,	b,	1·16	1·04 oz.
,,	c,	0·92	

This muscle acts as one of the depressors of the marsupial bone, and is inserted by a broad tendinous fascia into the upper third of the leg.

8. *M. semimembranosus,*	a,		1·18 oz.
,,	b,	0·73	0·84 oz.
,,	c,	0·94	

takes its origin from the middle third of the arch of the pubis, and is inserted by a narrow tendon into the top of the tibia; it is with difficulty separable from the *adductor magnus.*

9. *M. semitendinosus,*	a,		4·47 oz.
,,	b,	2·31	2·19 oz.
,,	c,	2·06	

This muscle arises from the tuber ischii, as usual, with a few fibres, forming the posterior border of the *gl. max.* from the first caudal vertebra; and is inserted by a tendon, 1½ in. to 2¼ in. long, into the upper third of tibia, by fascia common to it and to *gracilis.*

10. *M. biceps femoris,*	a,		14·98 oz.
,,	b,	6·62	6·13 oz.
,,	c,	5·64	

The *biceps* is blended, near its origin, with some fibres of the *semitendinosus,* and is inserted into the fascia of the thigh immediately below the great trochanter, into the lower part of the patellar fascia, from one-third to halfway down the leg.

11. *M. poplitœus,*	a,		0·68 oz.
,,	b,	0·27	0·24 oz.
,,	c,	0·20	

C.—*Muscles of Ankle and Foot.*

1. *M. gastrocnemius,* . . . . a, ... 7·47 oz.
,, ... b, . . 2·68
,, ... c, . . 2·04 } . . 2·36 oz.

Origin; on the outer side, from the back of the outer condyle, from tendon of *agitator caudæ,* and from under surface of one horn of the crescentic sesamoid bone lying below the outer condyle at the top of fibula; on the inner side, from the back of the inner condyle.

2. *M. flexor communis perforatus,* a, ... 6·85 oz.
,, b, . . 2·62
,, c, . . 2·11 } . . 2·37 oz.

Origin; from the inner horn of the crescentic sesamoid bone, with some fibres from the fascia of knee joint and outer condyle.

Insertion; at the calcaneum, the tendon is partly inserted on its inner side, and then passes on over the calcaneum (representing the *flexor brevis digitorum*), and is distributed (as *flexor perforatus*) to the near ends of both phalanges of the two large toes; at the outer side of the heel it gives off a smaller tendon, which runs direct to the *outer* of the large toes, and is joined near its base by a second tendon from the main trunk; both united form the *flex. perforatus* of that toe. It seems to contain the *solæus, plantaris,* and *flexor digitorum brevis* combined in one.

3. *M. flexor communis perforans* (*longus*), a, ... 2·61 oz.
,, b, . . 1·36
,, c, . . 1·12 } 1·24 oz.

arises from the upper two-thirds of back of tibia and fibula, except portion covered by *poplitæus;* and is distributed to the ungual phalanges of the four toes.

4. *M. peronæus longus,* . . b, . . 0·20
,, . . c, . . 0·14 } . . 0·17 oz.

takes origin from the top and upper half of the fibula, and from the fascia covering the other two *peronæi;* and after passing under the foot in the usual manner, its tendon is inserted into the near ends of the metatarsals of the two inner (small) toes.

5. *M. peronæus brevis,* . . . a, ... 0·39 oz.
,, . . . b, . . 0·12
,, . . . c, . . 0·09 } . . 0·11 oz.

Origin from the outer and upper third of fibula, and insertion into outer side of distal end of metacarpal of outer toe, and base of its first phalanx.

6. *M. peronæus tertius,* . . . b, ... 0·01 oz.

This little muscle arises from the middle of the fibula, below the other *peronæi,* and is inserted by means of a long silky tendon into the back of the outer and near end of the 1st phalanx of the 2nd toe (small).

7. *M. flexor proprius hallucis,*	b,		0·02 oz.

This muscle arises from the fascia covering the back of the *poplitæus*, with a few fibres running towards the head of the fibula; and is inserted into the os calcis, on the *inner* side of the groove made for the passage of the tendon of the *flexor digitorum perforans*.

8. *M. tibialis anticus,*	a,		4·46 oz.
,,	b,	1·91	1·58 oz.
,,	c,	1·24	

Inserted into the inner side of the near ends of the metatarsals of the 1st and 2nd toes (small).

9. *M. extensor communis digitorum,*	a,		1·23 oz.
,,	b,	0·51	0·43 oz.
,,	c,	0·34	

Distributed to the 3rd and 4th toes (large).

10. *M. extensor hallucis,*	b,		0·02 oz.

This little muscle takes origin from inner side of the head of the tibia, below the *tibialis anticus*, and its tendon, crossing the backs of the metatarsal bones, is distributed by two smaller tendons to the backs of the two inner toes (used chiefly for scratching), of which, with the *peronæus tertius*, it is the proper extensor.

D.—*Muscles of the Shoulder.*

1. *M. trapezius,*	a,		0·42 oz.
,,	b,	0·25	0·28 oz.
,,	c,	0·30	

This muscle is intimately blended with the cutaneous muscles of the neck, with the *omo-atlanticus* and *latissimus dorsi;* it takes its origin from the last three cervical and first six dorsal vertebræ.

2. *M. rhomboideus,*	a,		0·17 oz.
,,	b,	0·18	0·18 oz.
,,	c,	0·18	

Arises from the occiput, from all the cervical, and first three dorsal vertebræ.

3. *M. sterno-cleido-mastoideus,*	a,		0·39 oz.
,,	b,	0·33	0·32 oz.
,,	c,	0·31	

4. *M. omo-atlanticus,*	a,		0·45 oz.
,,	b,	0·25	0·26 oz.
,,	c,	0·26	

Arises from the transverse processes of the 1st, 2nd, and 3rd cervical vertebræ, and is inserted into the anterior fourth of the spine of scapula and whole of clavicle.

5. *M. serratus magnus,*	a,		0·97 oz.
,,	b,	0·88	0·89 oz.
,,	c,	0·90	

Arises from the costal processes (pleurapophyses) and ribs of the vertebræ, from the third cervical to the sixth dorsal.

6. *M. subclavius,*	a,		0·05 oz.
,,	b,	0·05	0·05 oz.
,,	c,	0·05	

This muscle takes its origin from the inner fourth, or cartilage of first rib, and is inserted along the whole length of the under surface of the clavicle.

E.—*Muscles of the Shoulder Joint.*

1. *M. latissimus dorsi,*	a,		1·13 oz.
,,	b,	0·71	0·81 oz.
,,	c,	0·90	

In addition to the *lat. dorsi,* occupying its usual position, there is an accessory cutaneous muscle, like that so fully developed in the Seal and other swimming animals, which is inserted, partly with the *lat. dorsi,* and partly over the *biceps,* with the *pectoralis;* it is, properly, a part of the *panniculus carnosus,* and takes its origin as far down as the symphysis pubis.

2. *M. pectoralis,*	a,		0·95 oz.
,,	b,	1·08	1·16 oz.
,,	c,	1·24	

takes origin from the whole length of the sternum. There is only one pectoral muscle.

3. *M. coracobrachialis,*	b,		0·02 oz.
4. *M. deltoideus,*	a,		0·42 oz.
,,	b,	0·36	0·38 oz.
,,	c,	0·40	

Arises from inner third of spine of scapula and clavicle.

5. *M. supraspinatus,*	a,		0·52 oz.
,,	b,	0·52	0·51 oz.
,,	c,	0·49	
6. *M. infraspinatus,*	a,		0·54 oz.
,,	b,	0·62	0·63 oz.
,,	c,	0·63	
7. *M. teres minor,*	b,		0·03 oz.

Arises from the anterior half-inch of lower edge of scapula, and is inserted below the flat tendon of the *infraspinatus;* its action is the same as that of the *glutæus quartus* (*iliocapsularis*).

8. *M. subscapularis,*	a,		0·69 oz.
,,	b,	0·81	0·79 oz.
,,	c,	0·76	
9. *M. teres major,*	a,		0·24 oz.
,,	b,	0·26	0·31 oz.
,,	c,	0·35	

F.—*Muscles of the Elbow.*

1. *M. triceps extensor,*	a,		1·97 oz.
,,	b,	1·23	1·26 oz.
,,	c,	1·28	
2. *M. anconæus,*	a,		0·09 oz.
,,	b,	0·14	0·08 oz.
,,	c,	0·01	
3. *M. biceps cubiti,*	a,		0·35 oz.
,,	b,	0·39	0·45 oz.
,,	c,	0·51	

This muscle, as in the other Marsupials, is in the Kangaroos composed of two muscles:—

a, *Coracoid biceps,*	0·25
b, *Longhead biceps,*	0·14
	0·39

The coracoid biceps takes its origin from the coracoid, and is inserted into the tubercle of the *radius,* as in man and other Mammals.

The longhead biceps arises from the margin of the glenoid cavity of the scapula, and its tendon passes over the head of the humerus; it is inserted with the tendon of of the *brachiæus* into the *ulna,* as in the Crocodile. The two muscles cross each other in their fibres, like a long **X**, or St. Andrew's cross.

4. *M. brachiæus* (*externus*),	a,		0·33 oz.
,,	b,	0·24	0·30 oz.
,,	c,	0·36	

Arises from the outer and posterior surface of the upper part of the humerus, winding round under the external deltoid ridge, inside the origin of the *supinator longus.*

G.—*Muscles of the Wrist and Hand.*

1. *M. supinator radii longus,*	a,		0·25 oz.
,,	b,	0·09	0·15 oz.
,,	c,	0·20	

The tendon of this muscle is distributed to the near ends of the metacarpals of pollex and index.

2. *M. extensor carpi radialis*, . . b, ... 0·14 oz.
Inserted by two tendons into the distal and radial sides of the metacarpals of index and middle finger.

3. *M. extensor digitorum communis*, b, . . 0·10 } . . 0·12 oz.
,, c, . . 0·14

Distributed to the ungual phalanges of the second, third, fourth, and fifth fingers.

4. *M. extensor minimi digiti*, . . b, ... 0·04 oz.

Extends third, fourth, and fifth fingers, and is very distinct from last.

5. *M. extensor carpi ulnaris*, . . b, ... 0·04 oz.
Inserted, as in man, into the outer and near end of the metacarpal of the little finger.

6. *M. extensor ossis metacarpi pollicis*, b, ... 0·09 oz.
Inserted into base of metacarpal of thumb.

7. *M. extensor primi internodii pollicis*, b, ... 0·03 oz.

8. *M. supinator radii brevis*, . . b, . . 0·04 } . . 0·04 oz.
,, . . c, . . 0·03

9. *M. pronator radii teres*, . . b, . . 0·10 } . . 0·11 oz.
,, . . c, . . 0·11
Inserted into upper third of radius.

10. *M. palmaris longus*, . . . c, ... 0·03 oz.

11. *M. flexor carpi radialis*, . . b, . . 0·10 } . . 0·12 oz.
,, . . c, . . 0·13
Inserted into base of metacarpal of thumb.

12. *M. flexor carpi ulnaris*, . . b, . . 0·07 } . . 0·07 oz.
,, . . c, . . 0·06

Takes its origin altogether from the edge of the ulna and inner side of the olecranon; and is inserted into the pisiform bone.

13. *M. flexor digitorum communis*, b, . . 0·76 } . . 0·67 oz.
,, c, . . 0·58

This muscle consists of the *flex. sublimis* and *profundus*, and *flex. pollicis longus*, all combined; the flex. sublimis portion takes an extensive origin from the broad flat tendon of *flex. profundus* and *flex. pollicis* just above the wrist, and having past the wrist, divides into four perforated tendons for the second, third, fourth, and fifth fingers.

14. *M. pronator quadratus*, . . . b, . . 0·02 } . . 0·02 oz.
,, . . . c, . . 0·02

Extends the whole length of both radius and ulna.

H.—*Muscles of the Spine.*

The muscles of the spine may be divided into the Direct and Oblique muscles, according as they pass from origin to insertion from and to similar or different processes of the vertebræ.

The Direct muscles are

1. Interspinal,
2. Intercostal,
3. Intertransversal.

The Oblique muscles are

1. Spino-costal, or costospinal;
2. Spino-transversal, or transversospinal;
3. Costo-transversal, or transversocostal.

Direct Muscles of the Spine.

I. *Interspinal Muscles,* passing from spinous process to spinous process, along the line of vertebræ. There are interspinal muscles developed, more or less, along the column, especially in the dorsal and lumbar portions.

II. *Intercostal Muscles.*—The costal processes of the cervical vertebræ are, as usual, well developed; and in the lumbar region they form broad horizontal expansions, which are continued, with modifications down the whole length of the tail.

a, *M. intercostalis lumbaris* (*quadratus lumborum*),

$$\left.\begin{array}{ll} ,, & c',\ 6{\cdot}08 \\ ,, & c,\ 7{\cdot}83 \end{array}\right\} \ .\ .\ 6{\cdot}96 \text{ oz.}$$

This muscle takes its origin from the interior quadrate surface of the ilium, Fig. 27 (*quad. lumb.*), and from the crest of ilium; and is inserted into the backs of the flat costal processes of all the lumbar vertebræ, into the edge of last rib, and posterior surfaces of next two ribs (extensor of lumbar spine).

$$\begin{array}{ll} \text{b, } \textit{M. intercostalis dorsalo-cervicalis,} & c',\ .\ .\ 2{\cdot}07 \\ \qquad\qquad ,, & c\ \ .\ .\ 1{\cdot}27 \end{array}\Big\} \ .\ .\ 1{\cdot}67 \text{ oz.}$$

From the costal processes of all the dorsals into the backs of the ribs (9 — 1), and of all the cervical costal processes (pleurapophyses), terminating at the mastoid process (extensor of dorsal and cervical spine).

$$\begin{array}{ll} \text{c, } \textit{M. intercostalis caudalis superior,} & c',\ .\ .\ 0{\cdot}68 \\ \qquad\qquad ,, & c,\ .\ .\ 0{\cdot}63 \end{array}\Big\} \ .\ .\ 0{\cdot}66 \text{ oz.}$$

This muscle is a horizontal wagger of the tail, and its origin is shown in Fig. 26 (*i. c. c*) from a line on the posterior interior edge of the ilio-ischium; it is inserted into the back of the costal expansion of the sacrum, and into the backs of the costal processes of the caudal vertebræ (1 — 6)—(extensor of caudal spine).

d, *M. intercostalis caudalis inferior*, c′, ... 1·70 oz.

Origin from the inner surface of the innominate bone, marked Fig. 27 (*int. cost. caud. inf.*), and from the adjoining under surface of the costal processes of the sacrum ; Insertion, into the under surfaces of the caudal costal processes (1 — 9)—(flexor of the caudal spine).

Fig. 27.

III. *Intertransversal Muscles.*

a, *M. intertransversalis caudalis superior*, c′, ... 2·82 oz.
„ c, ... 3·50 oz.

From the tips of the upper transverse processes of the caudal vertebræ (4 — 17, &c.) ; into the outer sides of the transverse processes of the last dorsal, and all the lumbar, sacral, and caudal vertebræ. This series of muscles fills the space between the superior transverse and costal processes in the tail. In the sacral and lumbar region it lies under the *gl. maximus* and *intercostalis lumbalis*—(extensor of lumbar and caudal spine).

b, *M. intertransversalis lumbalis superior*, c′, ... 0·56 oz.

joining the superior transverse processes of the lumbar vertebræ—(extensor of lumbar spine).

c, *M. intertransversalis caudalis inferior*, c′, ... 1·93 oz.

From the inferior transverse processes (hæmapophyses) of all the caudal vertebræ; into the bodies of the sacral vertebræ, and sides of inferior transverse processes of caudal vertebræ. This series is separated from the *intercostalis caudalis inferior* by the large nerve of the inferior part of tail, which supplies both—(flexor of caudal spine).

d, *M. intertransversalis lumbalis inferior* (*psoas parvus*).

„	a,		3·70 oz.
„	b,	2·14	1·74 oz.
„	c,	1·51	
„	c′,	1·58	

This muscle takes its origin from the spine of the pubis, and is inserted into the bodies of the vertebræ as high up as the diaphragm—(flexor of lumbar spine).

Oblique Muscles of the Spine.

I. *Spinocostal Muscles* (none).

II. *Spinotransversal Muscles.*

a, *M. spinotransversalis lumbalis* (*multifidus spinæ ?*) c′, . 3·20 oz.

From the backs of the transverse processes of all the vertebræ from the last dorsal to the third caudal; into the spinous processes of the vertebræ in front, and into the *raphe* above the spinous processes (extensor).

b, *M. spinotransversalis dorsalis*, . c′, ... 0·57 oz.
c, *M. spinotransversalis cervicalis*, . c′, ... 0·58 oz.

From the transverse processes of the cervical and first six dorsal (tubercle in front of rib articulation); is inserted direct into the occiput.

d, *M. spinotransversalis caudalis*, . c′ . . . . . . 0·63 oz.

III.— *Costotransversal Muscles.*

a. *M. spinocostalis lumbalis*, ... c, 0·81 } . 0·85 oz.
(*Sacrolumbalis*), ... c′, 0·88 }

From the anterior crest of the ilium, below the *quadratus* lumborum, into the outer sides of the transverse processes of all the lumbar vertebræ. This muscle acts as a "guy" to the back at either side. It was in a state of fatty degeneration in all the Kangaroos dissected by me.

J.—*Abdominal Muscles.*

1. *M. externus obliquus*, . . . a, ... 5·35 oz.

Takes its origin from the lumbar fascia, and from all the ribs, except the first; and is inserted into the whole length of the Marsupial bone, and into the inner edge of the pubis, above the symphysis, and into the edge of the ilium; it is continuous with the *pectoralis* at the extremity of the sternum.

2. *M. cremaster*, ... a, ... 0·38 oz.
,, ... b, ... 0·09 oz.

This muscle is from six to eight inches in length, and forms the lower border of *transversalis*, and takes its origin from the edge of the ilium. During coition it is reduced to two inches in length.

3. *M. transversalis*, ... a, ... 1·60 oz.

Arises from the superior anterior edge of the ilium, from the lumbar fascia, and from the last two ribs; and is inserted into the fascia of the *internus obliquus*.

4. *M. internus obliquus*, . . . a, ... 2·63 oz.

Arises from the last two ribs, and from the rib cartilages up to the xiphoid extremity of the sternum; and is inserted into the fascia abdominis.

5. *M. rectus abdominis,* . . . a, ... 3·43 oz.

Takes its origin from the first rib and middle line of the sternum and abdomen (27 inches long); and is inserted into the anterior surface and inner edge of the Marsupial bone, of which it is the proper levator.

K.—*Muscles of Mastication.*

1. *M. masseter externus,* . . . a, ... 0·44 oz.

Arises from the outer and lower portion of the zyzomatic arch, from the lower rim of the orbit and malar bone; and is inserted into the posterior fourth of the lower jaw, including the entire external surface of the marsupial horizontal process.

2. *M. masseter internus et M. temporalis,* . . a, . . 1·11 oz.

Inserted into the outer and inner surfaces of the coronoid process, and into the pit on the outer side of bone.

3. *M. pterygoideus internus,* . . a, ... 0·60 oz.

Takes its origin from the inner side of the pterygoid plate, with some fibres from the outer side, and from the fossa between it and palatal plate; and is inserted into the whole of the inner side of the marsupial horizontal ramus of the lower jaw. The action of this muscle is to push the cutting teeth of the lower jaw upwards and forwards against the upper incisors—an action in which it is powerfully assisted by the external masseter.

PART 2.—OPOSSUM AND PHALANGER.

THE following Tables contain the weights of the muscles of the Opossum and Phalanger dissected by me; and, as I have already entered into so much detail with respect to the muscles of the Kangaroos, it is the less necessary to specify particulars, except in the form of notes.

A.—*Muscles of the Hip Joint.*

	OPOSSUM.	PHALANGER.
	Oz. Av.	Grs.
1. Psoas magnus,	0·10	95
2. Iliacus,	0·11	
3. Pectinæus,	0·04	10
4. Adductor brevis,	0·12	—
5. „ magnus,	0·22	88
6. „ longus,	—	44
7. Obturator externus,	0·09	70
8. „ internus, &c.	0·04	
9. Quadratus femoris,	0·02	
10. Agitator caudæ,	0·09	50
11. Glutæus maximus,		45
12. „ medius,	0·15	125
13. Pyriformis,	0·02	
14. Glutæus minimus (distinct, though small),		20

B.—*Muscles of the Knee Joint.*

	OPOSSUM. Oz. Av.	PHALANGER. Grs.
1. Rectus femoris,	0·13	220
2. Vasti,	0·27	
3. Sartorius,	0·05	35
4. Gracilis,	0·11	60
5. Semi Membranosus,	0·16	150
6. Semi Tendinosus,	0·08	77
7. Biceps femoris	0·13	110

N. B.—The *Psoas parvus* in Phalanger weighed 33 grs.

C.—*Muscles of the Ankle and Foot* (OPOSSUM).

	Oz. Av.
1. Gastrocnemius et Solæus,	0·09
2. Plantaris,	0·02
3. Flexor dig. longus (perforans), (Distributed to five toes).	0·06
4. *Tibialis posticus,* (Inserted into near and inner side of the metatarsal of hallux).	0·02
5. Flexor hallucis longus, (Inserted into tarsal bones of hallux).	0.02
6. Peronæus longus,	0·03
7. Tibialis anticus,	0·03
8. Extensor dig. communis, (Four tendons).	0·01
9. Extensor hallucis, (Inserted into near end of first phalanx of hallux).	0·01

D.—*Muscles of Shoulder* (OPOSSUM).

1. *M. trapezius,* . . . . 0·25 oz.

Arises from the occiput, all the cervical, and all the dorsal vertebræ, except last; inserted into outer half of clavicle, acromion, whole spine of scapula, and vertebral edge of same.

2. *M. rhomboideus,* . . . . 0·07 oz.

Origin; occiput and spines of all the cervical and first six dorsal vertebræ.

3. *M. sterno-cleido-mastoideus,* . . . . 0·07 oz.

Origin from top of sternum and inner third of clavicle.

4. *M. omo-atlanticus,* . . . . 0·03 oz.

Arises from anterior fifth of spine of scapula; and is inserted into the transverse wing of the atlas.

5. *M. serratus magnus,* . . . . 0·23 oz.

Cervical vertebræ, 2—7; and ribs, 1—8.

6. *M. levator anguli scapulæ,* . . . . 0·02 oz.

Origin; from under surface of the wing of the atlas. Insertion; into the end of the spine of the scapula.

7. *M. omo-hyoideus*, ... 0·03 oz.

Origin; from the anterior point of vertebral edge of scapula. Insertion; usual.

8. *M. subclavius*, ... 0·01 oz.

Origin; from sternal end of first rib. Insertion; under surface of outer third of clavicle, and front of acromion.

E.—*Muscles of Shoulder Joint* (Opossum).

1. *M. latissimus dorsi*, ... 0·23 oz.

Origin; from the spines of (7—13) dorsal vertebræ, and from lumbar vertebræ by fascia. Insertion; beneath biceps by a tendon *distinct* from that of *teres major;* this tendon also gives origin to a fourth head of *triceps*, which is inserted into tip of olecranon and fascia of back of forearm.

N.B.—There is also an accessory cutaneous *lat. dorsi*, elliptical in shape, near the inner margin of, and inside, the true *latissimus dorsi;* its inner border reaches to the *pectoralis minor*. This muscle weighed 0·09 oz., and was inserted into the pectoral ridge of humerus, by fascia, and in line with insertion of *pectoralis minor.*

2. *M. subscapularis*, ...	0·14 oz.
3. *M. pectoralis minor* (long slip), ...	0·08 oz.
4. *M. pectoralis major*, ...	0·28 oz.
5. *M. coracobrachialis*, ...	0·01 oz.
6. *M. deltoideus*, ...	0·13 oz.

Origin; from the outer third of clavicle, acromion, and whole spine of scapula. Insertion; into the inner side of the pectoral ridge, outside *biceps*.

7. *M. supraspinatus*, ...	0·14 oz.
8. *M. infraspinatus*, ...	0·10 oz.
9. *M. teres major*, ...	0·08 oz.

F.—*Muscles of the Elbow.*

1. *M. triceps extensor cubiti*, ... 0·42 oz.

The fourth slip from *lat. dorsi* weighs 0·02 oz.

2. *M. anconæus*, ...	0·01 oz.
3. *M. biceps cubiti*, ...	0·09 oz.

This muscle is double, as in the Kangaroos—

1. *Coraco-radial*, . . .	0·06 oz.
2. *Ulno-scapular*, . . .	0·03 oz.

4. *M. brachiæus* (*externus*), ... 0·06 oz.

From upper and outer surface of humerus, outside deltoid ridge.

G.—*Muscles of the Wrist and Hand.*

1. *M. supinator radii longus,*	0·02 oz.

Inserted into carpal bone of thumb.

2. *M. extensor carpi radialis* (*longior*),	0·03 oz.

Inserted into the distal end of the metacarpal of index.

3. *M. extensor digitorum communis,*	0·02 oz.

Distributed to second, third, fourth, and fifth fingers.

4. *M. extensor primi digiti* (*indicator*),	0·01 oz.
5. *M. extensor minimi digiti,*	0·01 oz.
6. *M. extensor carpi ulnaris,*	0·03 oz.

Inserted into near end of metacarpal of little finger.

7. *M. extensor ossis metacarpi pollicis,*	0·02 oz.

Its tendon crosses those of *sup. rad. long.* and *ex. carp. radialis,* and is inserted into the outer side of the base of metacarpal of thumb.

8. *M. supinator radii brevis,*	0·01 oz.
9. *M. pronator radii teres,*	0·03 oz.
10. *M. palmaris longus,*	0·01 oz.

Inserted into the tendon of the *flex. prof.* in the palm.

11. *M. flexor carpi radialis,*		0·02 oz.
12. *M. flexor carpi ulnaris,*		0·05 oz.
13. *M. flexor digitorum communis,*		0·07 oz.
(*Sublimis et profundus,* *sublimis,*	0·03 oz.	
profundus,	0·04 oz.	
14. *M. pronator quadratus,*		0·01 oz.

J.—*Abdominal Muscles* (Opossum).

1. *M. externus obliquus,*	0·32 oz.

Its origin was similar to that described by Prof. Owen in the case of the Phalanger; and its insertion was into the upper and outer half of the Marsupial bone.

2. *M. pyramidalis,*	0·05 oz.

Arises from the whole inner margin of the marsupial bone, and is inserted into the raphe from the symphysis pubis as high up as two inches below the end of the sternum.

3. *M. rectus abdominis,*	0·21 oz.

Arises from the inner margin of the marsupial bone inside the origin of the *pyramidalis;* and is inserted along the raphe below the end of the sternum, sending upwards a strong distinct slip, which passes under the pectoral muscles and below a remarkable intercostal muscle

(4), to be finally inserted, broad and fleshy, into the sternal end of the first, second, and third ribs. Its total length is 9 inches.

4. *Intercostal muscle* (referred to above), ... 0·01 oz.

Arises from the lower third of the sternum; and is inserted into the middle of the second rib.

5. *M. cremaster*, ...	0·01 oz.
6. *M. internus obliquus*, ...	0·08 oz.

The Rev. Samuel Haughton, M. D., Fellow of Trinity College, Dublin, read the following paper:—

NOTES ON ANIMAL MECHANICS.

No. X.—MUSCULAR ANATOMY OF THE EMU (*Dromæus Novæ Hollandiæ*).

I am indebted to the kindness of Mr. Thomas Moore, Curator of the Derby Museum, of Liverpool, for the opportunity of dissecting a fine male specimen of the Emu (*Dromæus Novæ Hollandiæ*). This bird was sent to me from London (1865); and, having reached Dublin two days after death, was quite fresh, and in fine condition for dissection. On inspection it presented tubercles of the liver (Farre's?), an enormous developement of omental fat, and fibrinous clots, partly melanotic, in all its arteries.

I had also, through Professor Huxley, applied to the Council of the Zoological Society of London, for permission to dissect the muscles of the Ostrich, Emu, or Cassowary, in case such birds should die in their Gardens, and their bodies not be more favourably disposed of. In consequence of this application I received, 27th of April, 1866, the second Emu described in this note, which proved to be a larger and finer bird than the first; and I beg leave to take the present opportunity of returning my thanks to Professor Huxley, to Dr. Sclater, and to Dr. Murie, of the London Gardens, for the kindness with which they aided me in my attempt to procure specimens of these rare birds for the purposes of scientific research.

The examination of the muscles of these two Emus afforded the following results:—

A.—*Muscles of the Hip Joint.*

1. *M. psoas magnus*, ...	*none.*	
2. *M. iliacus*, ...	*none.*	
3. *M. pectinæus*, ...	*none.*	
4. *M. adductor brevis*, ...	*none.*	
5. *M. adductor magnus* (Fig. 28, *ad. mg.*), .	3·4	4·30 oz.
,, ...	5·2	